composed of one major subunit protein, AgfA and CsgA, respectively. The primary sequence of AgfA and CsgA are 74% identical and 86% conserved [Collinson, 1996]; no other characterized fimbrial proteins in existing sequence databases have notable sequence similarity to either protein. Curli have also been extensively characterized [Bian, 1997; Hammar, 1995; Hammar, 1996; Olsén, 1993; Römling, 1998; Römling, 1998]; the operon encoding curli production has been sequenced and characterized in *E. coli* [Hammar, 1995] and was recently shown to be conserved (identity of 78%) in *Salmonella typhimurium* [Römling, 1998], which also produces thin aggregative fimbriae. This evidence indicates that thin aggregative fimbriae and curli are both members of the same distinct class of fimbriae. The gene for TAF, *agfA* (*csgA*) has been detected in 99.8% (603/604) of *Salmonella* isolates, but is less representative in other members of the *Enterobacteriaceae*, including only 19.0% (26/137) *E. coli* strains [Doran, 1993]. *agfA* is therefore genotypic of *Salmonella* spp. and occasionally found in *E. coli* and its subspecies, suggesting its origins were in *Salmonella* spp. and coopted into *E. coli*.--

Please replace the paragraph beginning at page 18, line 20, with the following rewritten paragraph:

--*Salmonella* spp. are well developed vaccine vectors [Hackett, 1993]. Attenuated *Salmonella* strains can elicit protective immunity and induce secretory, humoral and cellular anti-*Salmonella* responses in hosts following oral immunization [Levine, 1996]. In addition, most *Salmonella* spp. are facultative intracellular pathogens [Fields, 1986] with a highly characterized invasion pathway [Galán, 1996] and can express antigens inside of host cells. These features, when combined with the ease of genetic manipulation in *Salmonella* spp., makes these facultative intracellular pathogens excellent candidates as vaccine vectors for the presentation of protective heterologous antigens [Curtiss III, 1994].--

B3

Please replace the paragraph beginning at page 19, line 23, with the following rewritten paragraph:

--Several methods of chromosomal gene replacement have been developed for the creation of *Salmonella* vaccine vectors (discussed above). However, these methods insert the recombinant genes into the chromosome at non-native sites. As a consequence, expression of the

B4

recombinant genes would be predicted to be altered. There is a need for a method of chromosomal gene replacement in *Salmonella* to insert recombinant genes into native regions normally occupied by the wild-type genes. Two such methods exist for chromosomal gene replacements in *E. coli*. The method by Hamilton *et al.* (1989) relies on the use of a temperature sensitive pSC101-derived vector to perform the replacements. Gene replacement by this method does not leave (or add) any extraneous DNA elements and one drawback is having to cure final strains of freely replicating vectors. A more recent method proposed by Link *et al.* (1997) uses a vector related to the one used by Hamilton *et al.* (1989) with the addition of the *sacB* selectable marker to the vector to allow for selection for loss of the vector sequence upon gene replacement.--

Please replace the paragraph title at page 24, line 11, with the following rewritten paragraph title:

--Expression of Heterologous Epitopes in *Salmonella* Flagella--

B5

In the Claims:

Please cancel claims 1-34, 41-44 and 48-53 without prejudice.

Please add new claims 56-74 to read as follows:

C1

56. (New) A recombinant nucleic acid molecule that encodes a chimeric AgfA fimbrin polypeptide comprising at least one heterologous antigen, wherein said chimeric polypeptide comprises an AgfA fimbrin amino acid sequence as set forth in SEQ ID NO:5 or a homologue thereof in which at least one fimbrin polypeptide segment that is present in SEQ ID NO:5 is replaced with a heterologous polypeptide antigen segment that is equal in length to the fimbrin polypeptide segment, or in which at least one fimbrin polypeptide segment that is present in the homologue of SEQ ID NO:5 is replaced with a heterologous polypeptide antigen segment that is equal in length to the fimbrin polypeptide segment.

B6